MU120 Mailing 3 2009J
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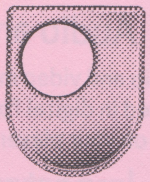
Stop Press
Read this first!



The Open University

MU120 – Open mathematics 2009J Stop Press 3

1 Essential course information

(i) Errata

Apologies for the inconvenience caused by these errata.

Ordnance Survey map

Bottom right corner of legend, insert next to diagram: At the centre of this sheet true north is 0° 07′ west of grid north. Magnetic north is estimated at 5° west of grid north for 1994 decreasing by about 0.5° every three years.

Unit 8

Page 104, Activity 55, part (b), fifth and sixth lines from the bottom should read:

$t = 325/110 = 2.95$ (to 2 d.p).

Unit 9

Please note that due to a printing error, there are some minor errors in this unit.

Page 18, Figure 13

Left-hand bubble should read 'First note in the scale'.

Right hand bubble should read 'Thirteenth note – the same as the first note but one octave up'

Page 24, Figure 19

Bubble should read 'seven semitone 'steps"

Page 56, Activity 5

Bubble in (a) should read 'Five semitone 'steps"

Bubble in (b) should read 'Four notes: a fourth'

(ii) Audio and video material

The audio and video materials for MU120 were originally presented on audio or video cassette but are now presented in digital format. To help you navigate around the audio, we suggest that you note down the track number on your player whenever you are asked to stop or pause the audio or video material.

2 Important advice for the course

(i) What to do if you get behind

If you fall behind **do not panic**. Do discuss plans for catching up and completing the course with your tutor, who will be happy to help you. The table below may help. As you can see from the table, some sections are very important, as later units build upon them, whereas others are not so important.

It may be possible for you to skim or even miss out certain sections of units and still successfully complete the course. In particular, the first unit of each block does not depend much on the last unit of the previous Block. So, for example, you can study Unit 6 without finishing Unit 5, you can start Unit 10 without finishing Unit 9, and you can start Unit 14 without finishing Unit 13. However if you do this you may not be able to answer all the assignment questions and so your overall course score is likely to be lower than if you study all the materials in detail.

You may like to discuss how substitution works with your tutor to help you to decide whether or not to miss out some TMA questions. Sometimes it is possible for your tutor to give you a short extension to the deadline for a TMA, but there is no extension for CMAs. So send in your CMAs on time, even if you have to make intelligent guesses for some questions. There is normally no extension for TMA04, however it is possible to reach the 20% threshold on this assignment even if you have not completed all the material in Blocks C and D. Don't hesitate to contact your tutor to ask any questions you may have about TMA04.

Remember that TMA04 and CMA45 revise the entire course, so it is well worth having a look at these assignments and making an early start even if you have not yet completed your study of the whole course.

Below is a summary of the main ways in which subsequent units depend upon different sections of each unit, to help you plan your studies if you get behind. Also, note that all the brain stretchers in the Calculator Book are optional. In previous years some students, who have been under pressure of time whilst studying MU120, have asked which activities they could omit. The third column below lists the activities, in Unit 5 onwards, which can be regarded as optional, and can therefore be omitted if you are short of time.

Unit	**Important sections - other sections, and associated assignment questions, may be skimmed or omitted if you are short of time**	**Optional activities**
1	All subsequent units depend upon this unit. The Calculator Book work is also important.	
2	The ideas in Sections 3, 4 and 6 are important for subsequent units. The Calculator Book work on entering data into lists (Chapter 2) is important for most subsequent units.	
3	Sections 2, 3, 4, 5 and 7 are needed for Units 4 and 5. The Calculator Book graphing work (Chapter 3) is important for many subsequent units.	
4	This unit is important for Unit 5, and the calculator work (Calculator Book 4.1) on setting up a scatter plot is important for many other units.	
5	Section 1 is important for many subsequent units and Section 5 for TMA 02. Calculator Book Section 5.1 provides good consolidation of the features from Block A which you will need in later units.	7-10, 19, 20, 22-30
6	Section 1 is important for Unit 14. The ideas of scale and sketching profiles from Section 2 are important for Unit 7 and later units. The ideas on bearings in Section 3 are important for Unit 14 and the ideas on formula for Unit 7 and subsequent units. The ideas on mathematical gradient from Section 4 are important for many subsequent units. The Calculator Book work (Chapter 6) on line graphs and arithmetic with lists is important for many subsequent units.	20, 33, 49
7	The work on graphs in Section 1 is important for many subsequent units, and that on distance, speed and time in Section 2 is important for Units 11 and 13. The calculator work on tables and lines (Calculator Book 7.1 and 7.2) is important for subsequent work and the program in 7.4 is useful to enter into your calculator for clearing the screen in subsequent graphical work. However programming the calculator is not a core part of the course.	2, 14, 22

8	The whole unit is extremely important for almost all later units as it lays the basis of algebra upon which the rest of the course builds. Similarly all the Calculator Book work in Chapter 8, on entering and graphing functions and solving equations, is very important for later work.	
9	The ideas on frequency in Section 1 are important for Units 14 and 15, as is the calculator work on trigonometric functions (Calculator Book 9.1 and 9.2). Section 4 consolidates the important algebraic, graphical and calculator skills from Block B and so is important for later units.	2-4, 5(b), 11, 14, 22
10	Sections 1 to 4 are very important for the rest of Block C. The calculator work on fitting a linear model (Calculator Book 10.1) is also very important for the rest of the block.	6, 24 (2nd part), 31, 35, 36
11	Sections 1 and 2 are important for Unit 13, as is the calculator work on finding the gradient and fitting a quadratic model to data (Calculator Book 11.2 and 11.3).	4, 30
12	Sections 1, 3 and 6 are needed for Unit 13 as is the calculator work in 12.1 and 12.2 and 12.4 of the Calculator Book.	1, 34, 35, 49, 60
13	Sections 1, 2 and 4 consolidate the work of the course so far and Unit 16 builds upon them. Calculator Book 13.2 consolidates regression modelling from Block C which is used in Unit 15 and Unit 16. Sections 4.4 and 5 are optional.	1, 15, 17, 34-39
14	Section 1 underpins Section 3, which contain ideas on trigonometry and geometry needed for Units 15 and Section 2 of Unit 16. Sections 2 and 5.2 are optional. If you are far behind omit Units 14 and 15, but do study Sections 1 and 5 of Unit 16.	11-14, 24, 29, 34, 35
15	Section 1 revisits some of the ideas on trigonometry from earlier in the course and Section 2 consolidates these and modelling ideas, along with Calculator Book 15.1. These are useful, but not essential, for Unit 16. Section 3 is optional.	18, 20-25
16	Sections 1 and 5 are very important for the final assignment and should be studied even if you have not studied the rest of the unit, or even if you are very far behind with the course. Section 2 consolidates some of the modelling and mathematical ideas from the course. Section 3 consolidates the programming ideas from the course. Sections 2, 3 and 4 are optional.	

(ii) Assessment Calculator

The Assessment Calculator can be used to monitor your progress on the course, and to obtain an estimate of what your final course result might be. Any TMA and CMA scores on your record are pre-filled, and then you need to estimate your score for any remaining assignments. Obviously the more assignment scores that are pre-filled the more accurate the result will be. To access the Assessment Calculator log onto your StudentHome page, go to 'Your record', and then to 'Existing scores'. The link to the calculator should be near your TMA scores. Full details on how to use the Assessment Calculator are provided on-screen.

(iii) Graph sketching and use of computers

From time to time tutors receive queries from students about graph sketching and, in particular, whether or not computer-generated graphs are acceptable. You might like to note the following MU120 Course Team response to questions about using software for writing mathematics and drawing graphs,

Each assignment aims to assess specific skills. Your aim should be to produce an assignment that demonstrates those skills to your tutor, with the minimum effort, unless you have lots of spare time. TMAs do not assess computer or artistic skills.

Even a very experienced user of, say, Equation Editor in Word can find that it is much, much faster to write mathematics by hand. Hand-written assignments are perfectly acceptable. If you use a word processor, it may be a good idea to leave gaps in text for graphs and mathematical symbols.

You will gain more understanding of the process of creating a graph if you produce it by hand rather than using a computer software package. So please do this wherever possible. Computer created graphs are acceptable, but may lose marks either for the graph itself or in a later part of the question because, for example, you are not able to describe the scales you chose. If you have difficulties with drawing graphs by hand, please discuss them with your tutor.

Please note that there is distinction between 'plotting a graph' which means creating a graph with points plotted accurately, and 'sketching a graph' which means showing the main features, for example where the graph crosses the axes. In both cases, remember to label axes (and any relevant features of the graph), mark the scales and include a title.

If you have doubts about what you need to submit for a TMA question, then please ask your tutor before submitting it.

(iv) Unit 6 – if you have online access

You may like to have a look at **http://www.ordnancesurvey.co.uk/oswebsite/index.html**. The education 'pages give lots of useful information. If you have trouble reading the detail of the map provided you can view sections of it by looking at "Get-a Map". Type in the grid ref of where you want it centred, prefixed by SK, for example, SK165876, and you can zoom in and out. You can also download and save the section you want (top right of the window). By putting it in a Word document you can enlarge it. Note that if you do enlarge the map, then you will need to think about the scale if you wish to calculate distances, for example.

(v) Unit 9

You are strongly advised to watch the Unit 9 video, band 7 on DVD00107 right at the start of your study of Unit 9, as the band will help you to understand the musical aspects of the Unit.

In Section 1 of Unit 9, the sine function is introduced in terms of the height of a point moving around a unit circle. Chapter 9 of the *Calculator Book* also looks at the cosine and tangent functions, but does not interpret them in terms of the unit circle. This is dealt with in Unit 14. A number of students have commented that it would be useful to see this in Unit 9. So below are two extracts from Unit 14, which you might like to read in conjunction with your study of page 16 of Unit 9 and sections 1 and 2 of Chapter 9 in the Calculator Book. Please note, however, that this material will not be assessed until Unit 14.

3.2 The cosine and tangent functions

In Chapter 9 of the *Calculator Book* you met two other trigonometric functions, namely *cos* (short for *cosine*) and *tan* (short for *tangent*). Like the sine, these functions can be defined in terms of a point *P* moving round the unit circle. As you have already seen, the sine of an angle is equal to the vertical height, *s*, of the point *P* in the unit circle. Similarly, the *cosine* of the angle θ is equal to the corresponding horizontal distance, *c*, in the unit circle (see Figure 37).

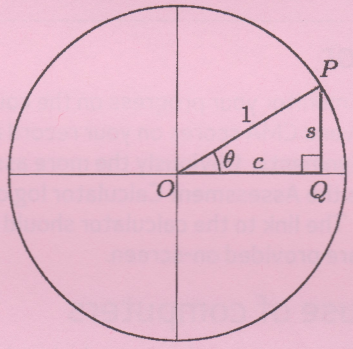


Figure 37 The unit circle.

Consider what happens to *c*, and hence to $\cos\theta$, as the point *P* travels anti-clockwise round the circle and the angle θ increases. Initially, when θ is 0, *P* and *Q* will coincide on the circumference of the unit circle, and $c(=\cos\theta)$ will be 1. Then, as *P* moves round the circle, and θ increases, the distance *c*, and correspondingly $\cos\theta$, decrease, becoming 0 when θ is $\pi/2$, or 90°. As *P* moves into the second quadrant, the value of *c*, and of $\cos\theta$, becomes negative, reaching a minimum of -1 when θ is π, or 180°. Thereafter, *c*, and $\cos\theta$, increase again, first to 0 when θ is $3\pi/2$, or 270°, and back to 1 when θ is 2π, or 360°, at the end of a complete turn. [...]

A tangent to a circle is a line that just touches the circle. (The Latin verb *tangere* means 'to touch', as in tangible.) The tangent function of an angle θ is related to this. In the unit circle in Figure 41, the line *AB* is a tangent line. The radius *OP*, when extended, meets this line at *B*. The tangent of the angle θ is given by the length, *t*, of *AB*. Thus $t = \tan\theta$.

Think once more about the point *P* travelling anti-clockwise round the unit circle. As the angle θ increases from 0 to $\pi/2$, or 90°, the length *t*, and correspondingly $\tan\theta$, get larger. But at $\pi/2$, OP becomes parallel to the tangent *AB*, so *t*, and hence $\tan\theta$, cannot be defined here. (Note that in the second and third quadrants, *OP* is extended backwards to meet *AB*, while in the first and fourth quadrants, *OP* is extended forwards.)

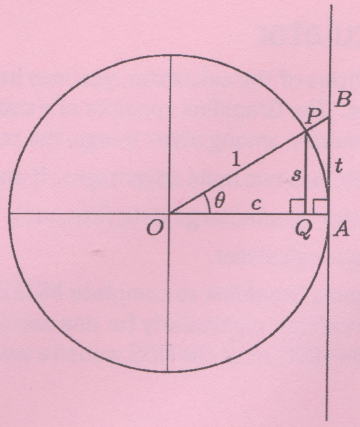


Figure 41 The unit circle with tangent.

As *P* moves still further round the circle, the line *OP* can be extended backwards to intersect the tangent *AB*. The distance, *t*, of the intersection from *A* again gives the value of $\tan\theta$. Because this distance is below *A*, $\tan\theta$ has a negative value. When *P* reaches the point where the angle θ is, π or 180°, the extended line will pass through *A*, and so $\tan\theta$ will be 0. As *P* travels further on, $\tan\theta$ takes positive values until θ is $3\pi/2$, or 270°, when it is again undefined. Thereafter, *P* moves into the fourth quadrant, and $\tan\theta$ is negative. Finally, *P* returns to the start when θ is 2π, or 360°, and $\tan\theta$ is again 0.

(vi) Help with using the calculator

Losing lists

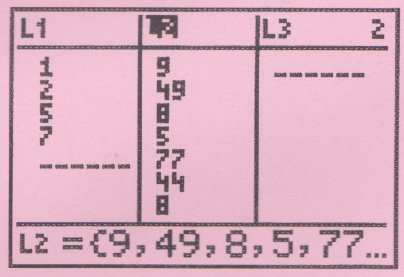
If you think you've cleared a list, say L2, but it seems to have disappeared entirely from the list screen, it may be that it has been deleted instead. The SetUpEditor command can be used to reset the list screen so that it displays the lists L1 ... L6 again by pressing [STAT] 5 [ENTER].

You can also restore a list by positioning the cursor on the next list (i.e. L3), and pressing [2nd][INS][L2].

Note that clearing a list and deleting it are two rather different things. You almost certainly deleted your list instead of clearing it. Try the following to see the difference.

Enter the list screen, move the cursor onto the list in question, say L2, and then upward to select the list name, as shown here. At this point you can choose whether to clear or delete it.

Pressing [CLEAR] here has the effect of removing the data contained in L2.



Incidentally, clearing data is permanent – once cleared you can't subsequently get the data back again. If instead you press [DEL] at this point, all evidence of the list is removed from the list screen. However, as was described above, you can easily restore it using SetUpEditor and you get your data back again into the bargain.

Keeping records of your calculator work

It can sometimes be quite difficult to find what you want in the Calculator Book when revising or just checking back for an earlier technique. You can help yourself to find your way around in the following two ways.

Each time you use a new calculator technique, keep a record in your learning file with the page reference;

Use the index of the Calculator Book.

Calculator Book Chapter 8 onwards

The *Calculator Book* uses the lower case letters like x and y in a formula to mean the same thing as the corresponding capital X and Y on the calculator, because the calculator only has keys for capital letters. So in general in the *Calculator Book*, the *x*, *y* etc used in formulas are the same as the X, Y etc keyed into the calculator. However, in other contexts *x* and X, *y* and Y may stand for different things and the distinction between a capital letter and a small letter may be crucially important.

There is an important distinction between *x* and X on the calculator keyboard. For example, pressing the [x^2] key does not produce X^2 on your calculator screen: 4[x^2] gives 4^2 not $4X^2$. To obtain $4X^2$ you need to press 4[X,T,Θ,n][x^2], as on page 128 of the *Calculator Book*. The other keys involving x behave similarly, for example 4[x^{-1}] gives 4^{-1}.

(vii) Graphlink for the calculator

As you become more familiar with the facilities of the calculator, you may be interested in the Graphlink which is available from Oxford Educational Supplies. The Graphlink consists of a cable to connect your calculator to a PC, together with a Resource CD-ROM that provides, among other things, the software to make Graphlink work.

Being able to connect your calculator to a PC has two main advantages. It enables you to:

- back up the contents of your calculator (programs, large data files, etc);
- make and save screen captures from your calculator.

It is important to stress that you do not need a Graphlink to complete MU120, or any other OU course. However some students find it useful to have the Graphlink, particularly for use outside their OU studies. The Graphlink is available from OES by phoning on 01869 344500, or at the OES website **www.oxford-educational.co.uk**.